

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

To:

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### NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

04.06.2004

Applicant's or agent's file reference  
AWP/P60423/001

### IMPORTANT NOTIFICATION

International application No.  
PCT/GB 03/03209

International filing date (day/month/year)  
30.07.2003

Priority date (day/month/year)  
30.07.2002

Applicant  
LOTUS CARS LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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7 JUL 2004

Name and mailing address of the international preliminary examining authority:



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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>AWP/P60423/001</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. <b>PCT/GB 03/03209</b>	International filing date (day/month/year) <b>30.07.2003</b>	Priority date (day/month/year) <b>30.07.2002</b>
International Patent Classification (IPC) or both national classification and IPC <b>F16K11/044</b>		
Applicant <b>LOTUS CARS LIMITED et al.</b>		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 6 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the opinion</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>		
Date of submission of the demand  <b>13.01.2004</b>	Date of completion of this report  <b>04.06.2004</b>	
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized Officer  <b>Awad, P</b>  Telephone No. +49 89 2399-7724	



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/GB 03/03209**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1, 4-10 as originally filed  
2, 3 received on 19.04.2004 with letter of 16.04.2004

**Claims, Numbers**

1-11 received on 19.04.2004 with letter of 16.04.2004

**Drawings, Sheets**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY-  
EXAMINATION REPORT**

International application No. **PCT/GB 03/03209**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	3-6
	No: Claims	1,2,7-11
Inventive step (IS)	Yes: Claims	
	No: Claims	3-6
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item I**

**Basis of the report**

**D4:** US-A-4 917 150 (KOCH ROBERT O ET AL) 17 April 1990 (1990-04-17)

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Claims 1 to 11**

**1.1 Independent claim 1**

**1.1.1** The document **D4** is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (see column 3, line 15 to column 7, line 26 and Fig. 1) a control valve for controlling flow of hydraulic fluid, the control valve comprising:

- a valve housing (10);
- a sleeve (52) slidable in a valve chamber in the valve housing;
- a first fluid conduit (SP) for connecting the valve chamber to a source of pressurised hydraulic fluid;
- a second fluid conduit (S) for connecting the valve chamber to a fluid return for returning hydraulic fluid to a reservoir;
- a third fluid conduit (CD) for connecting the valve chamber to deliver hydraulic fluid to and receive hydraulic fluid from apparatus which uses the hydraulic fluid flow controlled by the control valve;
- the sleeve (52) is a tubular sleeve having a tubular passage therethrough;
- the valve housing (10) has a pair of spaced apart valve seat surfaces, a first valve seat surface (first end of 14) which is engageable by a first end of the tubular sleeve and a second valve seat surface (second end of 14) which is engageable by a second end of the tubular sleeve;
- the third fluid conduit opens on to the valve chamber by way of a port which is surrounded by the first valve seat surface (see Fig. 1); and
- when the first end of the tubular sleeve engages the first valve seat surface (first end of 14) then fluid flows through the tubular passage in the sleeve from the third fluid conduit (CD) to the second fluid conduit (S) and when the

- second end of the tubular sleeve engages the second valve seat surface (second end of 14) then fluid flows through a gap between the first end of the tubular sleeve and the first valve seat (first end of 14) to the third fluid conduit (CD) from the first fluid conduit (SP) (see column 5, lines 7-18);
- a spring means (54) biases the sleeve (52) into engagement with first valve seat surface (first end of 14); and wherein
  - the spring means (54) acts directly on the sleeve (see Fig. 1).

1.1.2 Thus the subject-matter of claim 1 is not new in the sense of Art. 33(2) PCT.

1.2 Independent claim 2

The subject-matter of independent claim 2 is for the same reasons as mentioned above (see 1.1.1) not new in the sense of Art. 33(2) PCT.

1.3 Claims 3 to 11

The subject-matter of claims 3 to 11 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step, the reasons being as follows: The features of claims 3 to 11 are known from the cited documents (claims 7 to 11) or seem to fall within the scope of the customary practice of a person skilled in the art (claims 3 to 6).

**2. Further observations**

- 2.1 The application has an unnecessary plurality of independent claims (generally not more than one independent claim in the same category is necessary; Art. 6 PCT).
- 2.2 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 2.3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed is not mentioned in the description, nor is the relevant background art identified therein.

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valve seat surfaces, a first valve seat surface which is engageable by a first end of the tubular sleeve and a second valve seat surface which is engageable by a second end of the tubular sleeve;

the third fluid conduit opens on to the valve chamber by way of a port which is surrounded by the first valve seat surface; and

when the first end of the tubular sleeve engages the first valve seat surface then fluid flows through the tubular passage in the sleeve from the third fluid conduit to the second fluid conduit and when the second end of the tubular sleeve engages the second valve seat surface then fluid flows through a gap between the first end of the tubular sleeve and the first valve seat to the third fluid conduit from the first fluid conduit wherein:

a spring means biases the sleeve into engagement with the first valve seat surface;

characterised in that:

the spring means acts directly on the sleeve.

The present invention in a second aspect provides a control valve for controlling flow of hydraulic fluid, the control valve comprising:

a valve housing;

a sleeve slidable in a valve chamber in the valve housing;

a first fluid conduit for connecting the valve chamber to a source of pressurised hydraulic fluid;

a second fluid conduit for connecting the valve chamber to a fluid return for returning hydraulic fluid to a reservoir;

a third fluid conduit for connecting the valve chamber to deliver hydraulic fluid to and receive hydraulic fluid from apparatus which uses the

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hydraulic fluid flow controlled by the control valve,  
wherein:

5 the sleeve is a tubular sleeve having a tubular  
passage therethrough;

the valve housing has a pair of spaced apart  
valve seat surfaces, a first valve seat surface which  
is engageable by a first end of the tubular sleeve  
and a second valve seat surface which is engageable by  
10 a second end of the tubular sleeve;

the third fluid conduit opens on to the valve  
chamber by way of a port which is surrounded by the  
first valve seat surface; and

when the first end of the tubular sleeve valve  
15 engages the first valve seat surface then fluid flows  
through the tubular passage in the sleeve to the third  
fluid conduit from the first conduit and when the  
second end of the tubular sleeve engages the second  
valve seat surface then fluid flows through a gap  
20 between the first end of the tubular sleeve valve and  
the first valve seat from the third fluid conduit to  
the second fluid conduit; wherein:

a spring means biases the sleeve into engagement  
with the first valve seat surface;

25 characterised in that:

the spring means acts directly on the sleeve.

Both aspects of the invention share a common  
inventive feature that a sleeve is used to seal  
30 against two different end surfaces of the valve. In  
US-A-5064166 the tubular sleeve valve seals against  
only one end surface. The present invention provides  
a valve which has a connection to both a pressure line  
and a return line and which can control flow of fluid  
35 from the pressure line through the valve or flow  
through the valve back to a return line.



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## CLAIMS

1. A control valve for controlling flow of hydraulic fluid, the control valve comprising:

5 a valve housing;  
a sleeve slidable in a valve chamber in the valve housing;

a first fluid conduit for connecting the valve chamber to a source of pressurised hydraulic fluid;

10 a second fluid conduit for connecting the valve chamber to a fluid return for returning hydraulic fluid to a reservoir;

a third fluid conduit for connecting the valve chamber to deliver hydraulic fluid to and receive hydraulic fluid from apparatus which uses the hydraulic fluid flow controlled by the control valve, wherein:

the sleeve is a tubular sleeve having a tubular passage therethrough;

20 the valve housing has a pair of spaced apart valve seat surfaces, a first valve seat surface which is engageable by a first end of the tubular sleeve and a second valve seat surface which is engageable by a second end of the tubular sleeve;

25 the third fluid conduit opens on to the valve chamber by way of a port which is surrounded by the first valve seat surface; and

when the first end of the tubular sleeve engages the first valve seat surface then fluid flows through the tubular passage in the sleeve from the third fluid conduit to the second fluid conduit and when the second end of the tubular sleeve engages the second valve seat surface then fluid flows through a gap between the first end of the tubular sleeve and the first valve seat to the third fluid conduit from the first fluid conduit; wherein:

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a spring means biases the sleeve into engagement with the first valve seat surface; characterised in that:  
the spring means acts directly on the sleeve.

5

2. A control valve for controlling flow of hydraulic fluid, the control valve comprising:

a valve housing;

10 a sleeve slidable in a valve chamber in the valve housing;

a first fluid conduit for connecting the valve chamber to a source of pressurised hydraulic fluid;

15 a second fluid conduit for connecting the valve chamber to a fluid return for returning hydraulic fluid to a reservoir;

20 a third fluid conduit for connecting the valve chamber to deliver hydraulic fluid to and receive hydraulic fluid from apparatus which uses the hydraulic fluid flow controlled by the control valve, wherein:

the sleeve is a tubular sleeve having a tubular passage therethrough;

25 the valve housing has a pair of spaced apart valve seat surfaces, a first valve seat surface which is engageable by a first end of the tubular sleeve and a second valve seat surface which is engageable by a second end of the tubular sleeve;

30 the third fluid conduit opens on to the valve chamber by way of a port which is surrounded by the first valve seat surface; and

35 when the first end of the tubular sleeve valve engages the first valve seat surface then fluid flows through the tubular passage in the sleeve to the third fluid conduit from the first conduit and when the second end of the tubular sleeve engages the second valve seat surface then fluid flows through a gap between the first end of the tubular sleeve and the first valve seat from the third fluid conduit to the second fluid conduit; wherein:

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a spring means biases the sleeve into engagement with the first valve seat surface; characterised in that:  
the spring means acts directly on the sleeve.

5

3. A control valve as claimed in claim 1 or claim 2 wherein the tubular sleeve is connected by a rod to an armature located outside the valve chamber, the armature being located within an electrical coil also located outside the valve chamber.

10

4. A control valve as claimed in claim 3 wherein the spring means comprises a sprig which acts between a spring seat provided in the valve housing and a spring seat fixed to the exterior of the sleeve.

15

5. A control valve as claimed in claim 3 wherein the spring means applies a preload on the sleeve which must be overcome by a magnetic force applied to the armature by a magnetic field generated by the electrical coil before the sleeve moves away from the first valve seat surface.

20

6. A control valve as claimed in any one of the preceding claims wherein a compliant seal is provided to act between the exterior of the tubular sleeve and facing surface of the valve housing in order to prevent fluid passing along the outside of the tubular sleeve between the first and second fluid conduits and wherein the compliant seal deforms when the sleeve slides in the valve chamber so as to reduce or prevent sliding contact between the sleeve and the compliant seal.

30

7. A control valve as claimed in any one of the preceding claims wherein the first fluid conduit opens on to the valve chamber by way of a gallery which surrounds the first end of the tubular sleeve valve.

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8. A control valve as claimed in any one of the preceding claims wherein the second fluid conduit opens on to the valve chamber by way of a gallery which surrounds the second end of the tubular sleeve valve.

9. A control valve as claimed in any one of the preceding claims wherein the tubular sleeve valve has a tubular wall which tapers in thickness at both ends of the tubular sleeve valve.

10. A control valve system for controlling a hydraulic actuator which has a control valve as claimed in any one of the preceding claims, wherein the control valve is operated as a digital valve with rate of fluid flow through the control valve varied by controlling a timing of switching of the sleeve between engagement with the first and second valve seats.

11. A control valve substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

480773; 15/4/04